Reducing the carbon footprint of hospital-based care

Author: Charlie Tomson[A]

ABSTRACT

Climate change, driven by man-made greenhouse gas emissions, is a major threat to the health of this and future generations. Hospital-based healthcare generates large quantities of greenhouse gas emissions. Reducing the carbon footprint of healthcare requires direct action to reduce waste and energy use, but also requires radical reform of care pathways so that the only patients who come to or stay in hospital are people whose healthcare cannot safely be delivered closer to home. Achieving these reforms without major structural changes to the financial flows in the NHS will be extraordinarily difficult.

KEYWORDS: Climate change, carbon footprint, care pathways, service redesign, waste, patient-centred care

Introduction

There is now no reasonable doubt that anthropogenic climate change is happening[1–3] and that it will have profound adverse consequences for human health worldwide – particularly in under-developed countries that have done least to contribute to greenhouse gas emissions.[4–5] Healthcare professionals and planners have been slow to accept responsibility for taking action to mitigate climate change. Environmental sustainability should be included alongside safety, timeliness, effectiveness, efficiency, equity and patient-centredness as the seventh dimension of the quality of healthcare.[6,7] The hospitals of the future have major opportunities to mitigate climate change – both directly, by reducing their own carbon footprint, and indirectly, by influencing others in the societies they serve to do so. Even if the required actions do nothing to influence the future climate, they will contribute significantly to the financial sustainability of the service.[8]

Direct actions on greenhouse gas emissions

The healthcare industry itself is responsible, in England, for 18 million tonnes of CO_2 emissions. This amounts to 30% of total public sector greenhouse gas emissions, and 3.2% of the total CO_2 emissions of the country as a whole. Of these emissions, 22% come from building energy use, 18% from travel (of patients, visitors, and staff), and 59% from procurement[9] (Fig 1). The acute sector contributes disproportionately to these emissions – for instance, acute Trusts are the source of 65% of total NHS CO_2 emissions relating to building energy use. The CO_2 emissions from the NHS in England are greater than the total emissions from all aircraft departing from Heathrow airport.[8]

Direct energy use

The most obvious way in which hospitals can contribute to reduction in greenhouse gas emissions is to reduce energy use – for instance by taking actions on insulation, heating and lighting, by switching computers and monitors off when not in use, etc. Many estates departments have already achieved major financial savings, as well as carbon savings, in this way. Modern hospital architectural design can achieve major savings in this area, as discussed in greater detail in article by Sadler and Guenther in this issue.[10] The NHS Sustainable Development Unit (www.sduhealth.nhs.uk), Global Green and Healthy Hospitals (www.gghhconnect.net) and the Campaign for Sustainable Healthcare (www.sustainablehealthcare.org.uk) websites provide numerous resources and case examples. A recent report from the World Health Organization identified seven elements of a climate-friendly hospital (Box 1).

Many of the changes required to reduce direct energy use will also save money.[8] Money talks in the NHS: if individual directorates were provided with regular information on their energy expenditure (as they currently are with financial expenditure), and allowed to share in the some of the savings made, change would probably happen more rapidly.

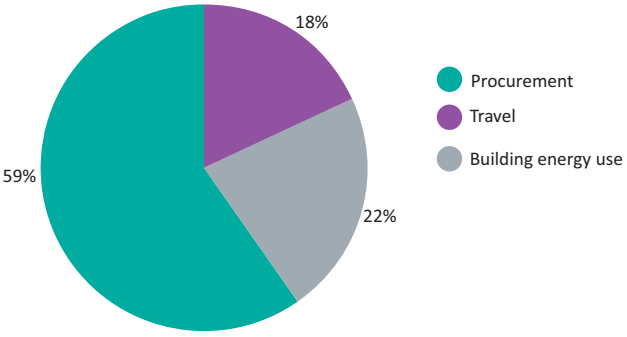

Fig 1. The carbon footprint of the NHS. Reproduced with permission from the NHS Sustainable Development Unit.[9]

Author: [A]Consultant nephrologist, Department of Renal Medicine, Freeman Hospital, Newcastle upon Tyne

Box 1. Seven elements of a climate-friendly hospital.[11]

1. **Energy efficiency.** Reduce hospital energy consumption and costs through efficiency and conservation measures.
2. **Green building design.** Build hospitals that are responsive to local climate conditions and optimised for reduced energy and resource demands.
3. **Alternative energy generation.** Produce and/or consume clean, renewable energy onsite to ensure reliable and resilient operation.
4. **Transportation.** Use alternative fuels for hospital vehicle fleets; encourage walking and cycling to the facility; promote staff, patient and community use of public transport; site health-care buildings to minimise the need for staff and patient transportation.
5. **Food.** Provide sustainably grown local food for staff and patients.
6. **Waste.** Reduce, re-use, recycle, compost: employ alternatives to waste incineration.
7. **Water.** Conserve water; avoid bottled water when safe alternatives exist.

Staff travel contributes significantly to the carbon footprint of healthcare. Hospitals should encourage active transport (walking or cycling) by collaborating with local authorities on suitable routes and by provision of secure cycle storage and shower/changing facilities; use of public transport (by collaboration with local providers); and car-sharing schemes. For those staff for whom car transport remains necessary, reimbursement and parking provision should incentivise use of low-carbon options such as electric or hybrid cars. Money talks: the practice of providing higher mileage reimbursement for users of cars with larger engine size should cease, or be reversed so that staff using low-carbon cars receive higher reimbursement per mile than those using 'gas-guzzlers'. Free parking for low-carbon cars could provide an additional incentive.

Wherever possible, travel should be avoided, by better use of virtual meetings using teleconference, videoconference and web-enabled meeting facilities. [12]

Key actions from the NHS Sustainable Development Unit's report *Low carbon travel, transport, and access* are shown in Box 2.

Waste reduction

Hospital care produces large amounts of waste, with operating theatres contributing a large proportion.[13–16] Disposal of 'biohazard' waste requires high-energy disposal processes, including incineration: putting potentially recyclable waste into a 'biohazard' container is therefore doubly wasteful. However, waste reduction is about much more than recycling. A recent comprehensive review from the Academy of Medical Royal Colleges provided seven recommendations and numerous case studies (Box 3).

Each specialty has its own carbon footprint, and its own opportunities to save money and carbon. In nephrology, for instance, the carbon footprint of dialysis has been characterised fully.[18,19] Examples of how money and carbon might be saved include the use of heat exchangers on dialysis machines, and the use of centralised dialysate supply or on-site preparation of dialysate (either of which avoids the use of large quantities of plastic containers to deliver dialysis concentrate to each machine). Re-using the reject water from reverse osmosis plants used to prepare ultra-pure water for haemodialysis can also save huge amounts of water.[20] If all kidney units adopted all of the 'sustainable' practices collated in a recent survey using the green nephrology network, annual savings could amount to £7m, 11,000 tonnes of greenhouse gases (CO_2 equivalent), and 470 million litres of water.[21]

Box 2. Key actions from the NHS Sustainable Development Unit report *Low carbon travel, transport, and access*.[12]

1. All Trusts should have a Board-approved active travel plan as part of their sustainable development management plan.
2. The NHS should consider introducing a flat rate for business mileage regardless of engine size or even modal option (car, cycle, and foot).
3. NHS organisations should establish consistent monitoring arrangements so reductions in emissions from road vehicles used for NHS business can be measured.
4. Mechanisms to routinely and systematically review the need for staff, patients and visitors to travel need to be established in all NHS organisations.
5. Healthcare delivery must continue to move closer to the home.

More efficient use of NHS buildings

According to a recent King's Fund report,[22] the NHS occupies 28.4 million square metres, excluding primary care premises – more than 10 times the area of the City of London. Currently, models of care are designed around these buildings. Many of the older buildings are unfit for purpose; many of the newer ones have been built under Private Finance Initiative contracts that severely limit the flexibility with which the buildings can be used. New care pathways (discussed below) will require new buildings designed for flexible use. Achieving this will require a revolution in how the NHS manages its estates.

Indirect actions to reduce greenhouse gas emissions

Reduction in pharmaceutical use: 'primum non nocere'

Procurement of pharmaceuticals contributes 22% of the entire carbon footprint of the NHS.[9] Actions that could reduce the carbon and financial cost of pharmaceuticals include:

- reducing waste associated with medications that are sent to the ward but not used before their expiry date[16]
- using the patient's own drugs during inpatient episodes[16]
- shared decision-making: ensuring that patients share in the decision to take a particular treatment before prescribing and dispensing it – although the evidence that any intervention can improve adherence remains weak[23]

Box 3. Recommendations made by the Academy of Medical Royal Colleges' report on cutting waste in clinical care.[17]

1. Doctors should embrace the values of resource stewardship in their clinical practice and use the waste reduction toolkit provided in this report to maximize the value of every intervention.
2. Medical Royal Colleges and specialist societies should establish mechanisms to identify the areas of waste within their specialty and provide leadership in tackling them using tools such as:
   a. the NICE 'do not do' recommendation database
   b. a 'Choosing Wisely' list of low-value interventions in for their specialty.
3. Local Education and Training Boards, deaneries and medical schools should support the development of clinical and leadership skills for high value care.
4. NHS organisations across the UK should provide doctors with the appropriate time and support to review their clinical practice to find areas where they can reduce wasted resource.
5. Health Commissioners should encourage the reduction of waste in clinical processes.
6. Public health authorities across the UK should create and support initiatives that reduce wasted resource in clinical settings.
7. All those working in health should take steps to increase their understanding of the carbon costs of health care activities.

- using 'starter packs' for new medication, so that only a short supply of treatment is wasted if the patient doesn't tolerate it
- carrying out regular medication reviews: poly-pharmacy and inappropriate prescribing are common amongst the elderly.[24–28] One study suggested that drug withdrawal (de-prescribing) in nursing home residents was associated with substantial reductions in 1-year mortality (21%, compared with 45% in a control group) and hospitalisation.[24] A 2014 Cochrane review concluded that interventions to improve poly-pharmacy in older people reduced inappropriate prescribing, but with no convincing effect (in either direction) on mortality[29] – evidence was of low quality, and further studies are needed.

Sustainable procurement

The NHS has huge purchasing power: two-thirds of its carbon footprint is generated during the production of goods and services that it procures.[30] NHS purchasers therefore have significant – but currently largely unused – power to influence their suppliers to ensure that these goods and services are produced in an environmentally sustainable way. Adopting a policy of purchasing food from local suppliers reduces the carbon footprint associated with transport of food, and supports the local economy. Similar advantages apply to the local purchase of many other consumables including office equipment. The NHS Supply Chain (www.supplychain.nhs.uk) provides a code of conduct that includes this statement: 'We expect our suppliers to strive to support NHS Supply Chain's climate protection goals through the products and services they deliver (eg by providing relevant data on climate protection). In this regard, we also expect our suppliers to take climate protection appropriately into account in their own operations, for example by setting climate protection goals for themselves and achieving them.'[31]

Influencing the local community

Hospitals have a major opportunity to influence public perception of the importance of environmental sustainability. Making a clear public commitment to environmental sustainability as a guiding principle in hospital design, purchasing policy, and in the design of care pathways sends a very clear message to employees, patients and visitors that the NHS considers climate change a real threat, and one that we can all do something about. Many hospitals now offer smoking cessation support to staff: the service is now being encouraged to take active steps to reduce obesity amongst its staff.[32] Obesity itself carries a significant carbon footprint due to the higher food requirements of obese people and the increased fuel costs of transporting a heavier population.[33] There are clear parallels here with how doctors' changing attitudes to tobacco use eventually resulted in major reductions in smoking amongst the general public[34] – with the difference that we cannot afford the 50-year delay between recognition of the problem and action to mitigate it.[35]

Sustainable care pathways

Making future healthcare environmentally (and financially) sustainable is about very much more than switching off the lights and recycling: sustainability cannot be left with the Estates department. Reducing avoidable hospital admissions and reducing length of stay, for instance, will save both money and carbon. By some estimates, 60% of current hospital inpatients don't need to be in hospital.[36]

Segregation of emergency and elective care

Current hospitals house three very different types of activity: outpatient consultations, emergency treatments, and elective surgery. There is no reason other than history and the convenience of some doctors that these three activities all need to happen in hospital. A strong case can be made for physical separation of elective surgery and emergency care, in separate buildings, so that maximum use can be made of operating facilities and beds; use of surgical beds (and the consequent cancellation of operating time) by emergency admissions causes waste of money and carbon.[36] Although the Darzi 'polyclinic' idea was sold poorly,[22] the basic concept remains

sound: we would achieve better, cheaper, more environmentally sustainable healthcare if we created multi-purpose, flexible facilities for extended primary care teams, integrated community and social care staff, diagnostics, and specialist consultation.

Telemedicine

Bringing people to hospital-based outpatient clinics for routine review can only be justified if the consultation provides sufficient added value.[37] Every time a patient is seen in such a clinic, the clinician should ask themselves (and their patient) 'what did we decide today that required a physical visit to the hospital?' Diseases in which repeated physical examination by a specialist is required clearly require face-to-face consultations. Disorders in which management decisions are based on the history combined with laboratory or radiological investigation do not, on the face of it, require a face-to-face consultation – particularly if, as is commonly the case, the test or imaging results are not even available at the time of the visit. Bringing patients to clinic for 'routine review' so that the doctor can decide to order a test, followed by a review appointment in three months time so that the doctor is reminded to review the results of the test and make the next decision, sounds like a caricature – but is a frequent reality. This is not only poor care, but also shows institutional disrespect for patients and is wasteful of money and carbon.

There is no doubt that telemedicine could reduce the carbon footprint of healthcare.[38] Particularly for patients with chronic disease who already know the doctor phoning them (for instance, kidney transplant recipients,[39] the benefits far outweigh the risks. Whether telehealth generates *additional* benefits, for instance by increasing patient 'empowerment' or reducing readmission rate, remains less certain.[40]

Improving the 'empowerment' of patients with chronic conditions

The majority of hospital inpatients are patients with multiple chronic conditions. There is high-quality evidence that patients who feel in control of their disease (empowered, or activated, patients) consume fewer healthcare resources, require fewer hospital admissions, and have better outcomes than those patients who remain passive recipients of healthcare.[41–45] Association doesn't prove cause, however: higher activation scores are associated with higher educational attainment and socioeconomic status, which could be independently associated with different health behaviours. However, there is increasing evidence that low activation is a 'treatable' condition, and thus that interventions that improve patient's involvement and understanding of their own management can result in better outcomes – including lower utilization of hospital care[46] and lower uptake of 'preference-sensitive' options.[47] These findings put actions to improve patient engagement high on the agenda – both for the financial sustainability of the NHS[32] and for its environmental sustainability. A series of systematic reviews summarise how to improve self-management,[48] shared decision-making,[49] patient experience,[50] information and understanding,[51] and promoting prevention.[52]

Improving end of life care

Most people would prefer to die at home, yet many end up dying in hospital without a medical need to do so.[53] The estimated cost for a day of community care at the end of life is £145, compared to £425 for a specialist palliative inpatient bed day in hospital.[54] Improving end-of-life care by working more closely with hospices and social care agencies would therefore improve not only quality of death but also financial and environmental sustainability. Encouraging the use of advance directives by people with life-limiting chronic diseases could also help, yet the use of such directives remains the exception rather than the rule. How these options are presented can also influence whether people choose life-extending care over palliative care.[55]

Reforming the payment system

Payment by Results has arguably improved some aspects of surgical provision, but now also provides a major financial incentive to increase hospital-based activity, regardless of results.[8] Hospitals currently get paid if they see patients – and paid more if patients develop complications or require an intensive care unit (ITU) stay. Hospitals have little financial incentive to invest in upstream prevention of the need for hospital care. Negotiating payment for telephone or virtual clinics currently has to be done on an ad hoc basis, clinical commissioning group (CCG) by CCG. At the same time, GPs are paid by capitation and are being asked to take on ever-increasing responsibilities for chronic disease management without any additional funding. As Corrigan and Mitchell put it, 'we have a funding mechanism that encourages the most expensive organisations to deal with more people without there being a similar encouragement for the less expensive parts of the NHS'.[36] Similarly, the current creeping privatization of the NHS will inevitably provide further incentives to 'do more work', regardless of the value added: no provider with an obligation to return a profit for shareholders will have any interest in reducing its market share.

Hypocrisy, tokenism, and shifting the curve

I have no direct conflicts of interest. I don't own a car, I cycle to work, and I grow my own vegetables. However, I have taken short-haul flights more often that I should, so I'm open to the charge of hypocrisy. Guilty as charged. But we only have a chance of improving the sustainability of the NHS if the great majority of people – we hypocrites included – take some steps to reduce their carbon footprint. If we allow the fact that we're imperfect to provide an excuse for not taking action, and leave it to the perfect few (who never fly, drive, or turn the heating on) to change the world, we'll never see change. Just as with blood pressure in the general population,[56] shifting the entire population to consume slightly less carbon, and then even less, will generate far greater benefits than leaving the responsibility to those who are already nearly perfect. ■

References

1 McCoy D, Hoskins B. The science of anthropogenic climate change: what every doctor should know. *BMJ* 2014;349:g5178.
2 Montgomery H. Climate change: how grave the threat? Clin Med 2009;9:309–10.
3 Godlee F. Climate change. *BMJ* 2014;349:g5945.

4 Costello A, Abbas M, Allen A, *et al.* Managing the health effects of climate change: Lancet and University College London Institute for Global Health Commission. *Lancet* 2009;373:1693–733.
5 Patz JA, Frumkin H, Holloway T, Vimont DJ, Haines A. Climate change: challenges and opportunities for global health. *JAMA* 2014;312:1565–80.
6 Atkinson S, Ingham J, Cheshire M, Went S. Defining quality and quality improvement. *Clin Med* 2010;10:537–9.
7 Connor A, O'Donoghue D. Sustainability: the seventh dimension of quality in health care. *Hemodialysis International* 2012;16:2–5.
8 Naylor C, Appleby J. *Sustainable health and social care: connecting environmental and financial performance.* London: King's Fund, 2012. Available online at www.kingsfund.org.uk/sites/files/kf/field/field_publication_file/sustainable-health-social-care-appleby-naylor-mar2012.pdf [Accessed 2 December 2014].
9 NHS Sustainable Development Unit. *Saving carbon, improving health.* SDU, 2009. Available online at www.sduhealth.org.uk/resources/default.aspx [Accessed 2 December 2014].
10 Sadler BL, Guenther R. Ten rules for 21st century healthcare: a US perspective on creating healthy, healing environments. *Future Hosp J* 2015;2:22–7.
11 World Health Organisation. *Healthy hospitals, healthy planet, healthy people: Addressing climate change in healthcare settings.* WHO, 2009. Available online at www.who.int/globalchange/publications/climatefootprint_report.pdf [Accessed 2 December 2014].
12 NHS Sustainable Development Unit. Low carbon travel, transport, and access. SDU, 2009. Available online at www.sduhealth.org.uk/areas-of-focus/carbon-hotspots/travel.aspx [Accessed 2 December 2014].
13 Hutchins DC, White SM. Coming round to recycling. *BMJ* 2009;338:b609.
14 Scally G. Environmental waste in health care. *BMJ* 2009;338:b1129.
15 Stall NM, Kagoma YM, Bondy JN, Naudie D. Surgical waste audit of 5 total knee arthroplasties. *Can J Surgery* 2013;56:97–102.
16 Waste Resources and Action Programme. *Demonstrating the value of waste prevention in the NHS.* WRAP, 2014. Available online at www.sduhealth.org.uk/documents/news/WRAP_report.pdf [Accessed 2 December 2014].
17 Academy of Medical Royal Colleges. *Protecting resources, promoting value: a doctor's guide to cutting waste in clinical care.* AoMRC, 2014. www.aomrc.org.uk/publications/reports-a-guidance?view=docman [Accessed 2 December 2014].
18 Connor A, Lillywhite R, Cooke MW. The carbon footprints of home and in-center maintenance hemodialysis in the United Kingdom. *Hemodial Int* 2011;15:39–51.
19 Tomson C, Connor A. Outlook: Implications of climate change for nephrology. *Nat Rev Nephrol* 2014, in press (doi: 10.1038/nrneph.2014.199).
20 Agar JWM, Simmons RE, Knight R, Somerville CA. Using water wisely: new, affordable, and essential water conservation practices for facility and home hemodialysis. *Hemodial Int* 2009;13:32–7.
21 Limb M. NHS could save £1bn by adopting green strategies used in kidney units. *BMJ* 2013;346:f588.
22 Edwards N. *NHS buildings: obstacle or opportunity?* King's Fund, 2013. Available online at www.kingsfund.org.uk/sites/files/kf/field/field_publication_file/perspectives-estates-nhs-property-nigel-edwards-jul13.pdf [Accessed 2 December 2014].
23 Nieuwlaat R, Wilczynski N, Navarro T, *et al.* Interventions for enhancing medication adherence. *Cochrane Database Syst Rev* 2014;11:CD000011.
24 Garfinkel D, Zur-Gil S, Ben-Israel J. The war against polypharmacy: a new cost-effective geriatric-palliative approach for improving drug therapy in disabled elderly people. *IMAJ* 2007;9:430–4.
25 Iyer S, Naganathan V, McLachlan AJ, Le Couteur DG. Medication withdrawal trials in people aged 65 years and older: a systematic review. *Drugs Aging* 2008;25:1021–31.
26 Garfinkel D, Mangin D. Feasibility study of a systematic approach for discontinuation of multiple medications in older adults: addressing polypharmacy. *Arch Intern Med* 2010;170:1648–54.
27 Dalleur O, Spinewine A, Henrard S, *et al.* Inappropriate prescribing and related hospital admissions in frail older persons according to the STOPP and START criteria. *Drugs Aging* 2012;29:829–37.
28 Nyborg G, Straand J, Brekke M. Inappropriate prescribing for the elderly – a modern epidemic? *Eur J Clin Pharmacol* 2012;68:1085–94.
29 Patterson SM, Cadogan CA, Kerse N, *et al.* Interventions to improve the appropriate use of polypharmacy for older people. *Cochrane Database Syst Rev* 2014;10:CD008165.
30 McGain F, Naylor C. Environmental sustainability in hospitals – a systematic review and research agenda. *J Health Serv Res Policy* 2014;19:245–52.
31 NHS Supply Chain. *Supplier Code of Conduct: main principles for suppliers.* NHS, 2013. Available online at www.supplychain.nhs.uk/about-us/sustainability/~/media/Files/Suppliers/Supplier_code_of_conduct.ashx [Accessed 2 December 2014].
32 NHS England. *Five year forward view.* NHS England, 2014. Available online at www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf [Accessed 2 December 2014].
33 Edwards P, Roberts I. *Population adiposity and climate change. Int J Epidemiol* 2009;38:1137–40.
34 Simpson D. *Medicine's Big Challenge: Doctors and Tobacco.* BMJ Books, 2000.
35 Nilsson M, Beaglehole R, Sauerborn R. Climate policy: lessons from tobacco control. *Lancet* 2009;374:1955–6.
36 Corrigan P, Mitchell C. *The hospital is dead, long live the hospital: sustainable English NHS hospitals in the modern world.* Reform, 2011. Available online at www.reform.co.uk/resources/0000/0302/The_hospital_is_dead.pdf [Accessed 2 December 2014].
37 Porter ME. What is value in health care? *NEJM* 2010;363:2477–81.
38 Holmner A, Ebi KL, Lazuardi L, Nilsson M. Carbon footprint of telemedicine solutions--unexplored opportunity for reducing carbon emissions in the health sector. *PloS One* 2014;9:e105040.
39 Connor A, Mortimer F, Higgins R. The follow-up of renal transplant recipients by telephone consultation: three years experience from a single UK renal unit. *Clin Med* 2011;11:242–6.
40 Car J, Huckvale K, Hermens H. Telehealth for long term conditions. *BMJ* 2012;344:e4201.
41 Charmel PA, Frampton SB. Building the business case for patient-centered care. *Healthc Financ Manage* 2008;62:80–5.
42 Hibbard JH, Greene J. What the evidence shows about patient activation: better health outcomes and care experiences; fewer data on costs. *Health Affairs* 2013;32:207–14.
43 Marshall R, Beach MC, Saha S, *et al.* Patient activation and improved outcomes in HIV-infected patients. *J Gen Intern Med* 2013;28:668–74.
44 Mitchell SE, Gardiner PM, Sadikova E, *et al.* Patient activation and 30-day post-discharge hospital utilization. *J Gen Intern Med* 2014;29:349–55.
45 Hibbard JH, Greene J, Overton V. Patients with lower activation associated with higher costs; delivery systems should know their patients' 'scores'. *Health Affairs* 2013;32:216–22.
46 Wennberg DE, Marr A, Lang L, O'Malley S, Bennett G. A randomized trial of a telephone care-management strategy. *NEJM* 2010;363:1245–55.
47 Veroff D, Marr A, Wennberg DE. Enhanced support for shared decision making reduced costs of care for patients with preference-sensitive conditions. *Health Affairs* 2013;32:285–93.
48 National Voices. *Prioritising person-centred care. Supporting self-management.* National Voices, 2014. Available online at www.nationalvoices.org.uk/sites/www.nationalvoices.org.uk/files/supporting_self-management.pdf [Accessed 2 December 2014].
49 National Voices. *Prioritising person-centred care. Supporting shared decision-making.* National Voices, 2014. Available online at

www.nationalvoices.org.uk/sites/www.nationalvoices.org.uk/files/supporting_shared_decision-making.pdf [Accessed 2 December 2014].
50 National Voices. *Prioritising person-centred care. Enhancing experience.* National Voices, 2014. Available online at www.nationalvoices.org.uk/sites/www.nationalvoices.org.uk/files/enhancing_experience.pdf [Accessed 2 December 2014].
51 National Voices. *Prioritising person-centred care. Improving information and understanding.* National Voices 2014. Available online at www.nationalvoices.org.uk/sites/www.nationalvoices.org.uk/files/improving_information.pdf [Accessed 2 December 2014].
52 National Voices. *Prioritising person-centred care. Promoting prevention.* National Voices, 2014. Available online at www.nationalvoices.org.uk/sites/www.nationalvoices.org.uk/files/promoting_prevention.pdf [Accessed 2 December 2014].
53 Abel J, Rich A, Griffin T, Purdy S. End-of-life care in hospital: a descriptive study of all inpatient deaths in 1 year. *Pall Med* 2009;23:616–22.
54 Marie Curie Cancer Care. *Understanding the cost of end of life care in different settings.* Marie Curie Cancer Care, 2014. Available online at www.mariecurie.org.uk/Documents/HEALTHCARE-PROFESSIONALS/commissioning-services/understanding-cost-end-life-care-different-settings.pdf [Accessed 2 December 2014].
55 Halpern SD, Loewenstein G, Volpp KG, *et al.* Default options in advance directives influence how patients set goals for end-of-life care. *Health Affairs* 2013;32:408–17.
56 Tunstall-Pedoe H, Connaghan J, Woodward M, Tolonen H, Kuulasmaa K. Pattern of declining blood pressure across replicate population surveys of the WHO MONICA project, mid-1980s to mid-1990s, and the role of medication. *BMJ* 2006;332:629–35.

Address for correspondence: Dr C Tomson, Department of Renal Medicine, Freeman Hospital, Newcastle upon Tyne, NE7 7DN. Email: charles.tomson@nhs.net